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(71) Applicant and

(72) Inventor: **MARKS, Peter, John** [AU/AU]; Flat 2, 24
Foote Street, Albert Park, Victoria 3206 (AU).

(74) Agent: **GRIFFITH HACK**; GPO Box 1285K, Level 3,
509 St Kilda Road, Melbourne, Victoria 3001 (AU).

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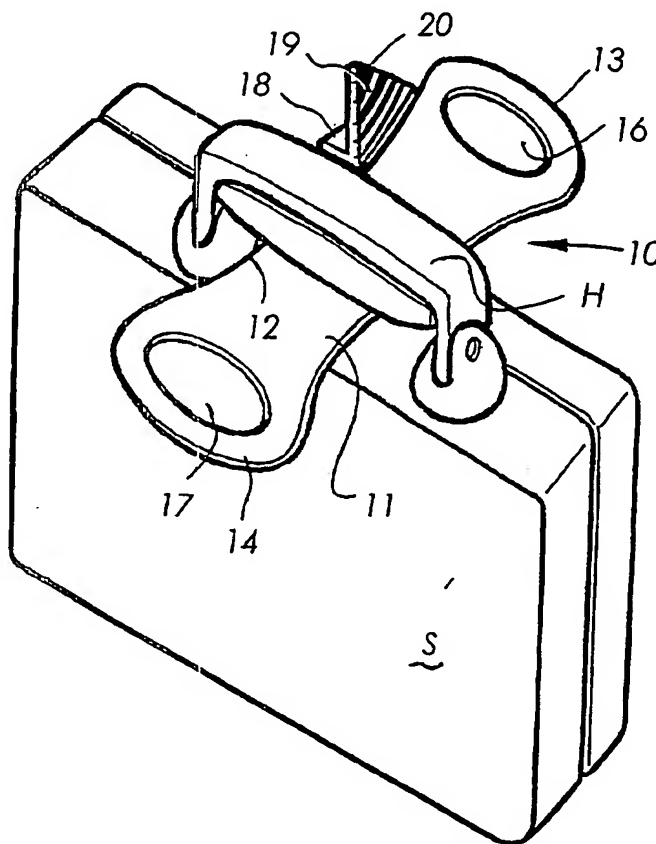
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(54) Title: **WEIGHING DEVICES**



(57) Abstract: A weighing device (10) for providing a ready indication of the weight of a piece of luggage (5), the device comprising load bearing means (11) adapted to be placed on or form part of the carry means of the piece of luggage (H) and indicator means (19) associated with the load bearing means whereby when the luggage is lifted by the carry means (H), the load bearing means is subjected to the mass of the piece of luggage and the indicator means provides an indication of the weight of the piece of luggage.

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WEIGHING DEVICES

5 FIELD OF THE INVENTION

This invention relates to weighing devices and in particular relates to devices that provide a ready indication of the weight of a piece of luggage.

10

BACKGROUND OF THE INVENTION

Commercial aircraft have to place strict controls on the amount and weight of luggage that passengers carry on the aircraft. Tourists and international travelers often experience difficulties in ascertaining the weight of their luggage and this can result in fines and surcharges for being overweight. Whilst the check-in counters have scales that accurately weigh luggage it is often then too late for a passenger to re-organise his or her luggage. What is needed and what is apparently absent from the marketplace today is a simple means of providing an indication of the weight of a piece of luggage so that passengers can determine the weight of the luggage before they reach the airport.

The issue of overweight luggage also has serious ramifications with regard to health and safety considerations. Heavy suitcases, rucksacks or satchels can cause serious spinal injuries. Research has indicated that children, and/or adults, should not over lengthy periods transport more than 10% of their weight. In Australia there is a common practice for school children to carry their text books, exercise books and even laptops in satchels or rucksacks. Often very small and frail children end up carrying loads far in excess of those recommended by the medical profession. Parents and staff of schools and

other educational establishments need a ready indication of when a child is lifting or transporting overweight luggage.

It is these needs that have brought about the present
5 invention.

SUMMARY OF THE INVENTION

According to one aspect of the present invention there is
10 provided a weighing device for providing a ready indication of the weight of a piece of luggage comprising load bearing means adapted to be placed through a carry handle of the piece of luggage and indicator means associated with the load bearing means whereby when the luggage is lifted via
15 the load bearing means or carry handle the load bearing means is subjected to the mass of the piece of luggage and the indicator means provides an indication if a predetermined threshold mass has been exceeded.

20 According to a further aspect of the present invention there is provided a piece of luggage having a carry handle assembly comprising a handle connected to the piece of luggage, a pressure plate under the handle, a load cell between the pressure plate and the handle and means to
25 provide an indication of weight coupled to the load cell wherein when the piece of luggage is lifted by the handle, the weight of the piece of luggage is transmitted to the load cell by contact with the pressure plate.

30 DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

35 Figure 1 illustrates a first embodiment of a weighing device which is inserted under a handle of a suitcase;

Figure 2 shows the device when placed under load;
Figures 3a, 3b and 3c are side view of the device
under varying loads;

Figure 4 illustrates a second embodiment of a
weighing device supported by a hand;

Figure 5 shows the device of Figure 4 when held
under the handle of a suitcase to weigh the
suitcase;

Figure 6 illustrates a third embodiment in which
a weighing device is also supported by a user's
hand;

Figure 7 shows the device of Figure 6 when
inserted under the handle of a suitcase to weigh
the suitcase;

Figure 8 illustrates a fourth embodiment in which
a weighing device is incorporated into the handle
of suitcase;

Figure 9 is an exploded view of the handle
assembly of Figure 8;

Figures 10a and 10b are schematic side
elevational views of the handle of Figure 8 when
free standing and under load;

Figure 11 is an illustration of a variation of
the fourth embodiment;

Figure 12 is an exploded view of the handle
assembly in accordance with a fifth embodiment;

Figure 13 is a perspective view of a school
satchel or rucksack incorporating a weighting
device of a sixth embodiment;

Figures 14a, 14b, and 14c show the device of
Figure 13 in various loaded configurations;

Figures 15a and 15b are exploded views of the
device in unloaded and loaded configurations;

Figures 16a and 16b are perspective views of a
weighting device in accordance with a seventh
embodiment in a loaded and unloaded
configuration; and

Figures 17a, 17b, and 17c are exploded views of the device in an unloaded, partially loaded and fully loaded configuration.

5 DESCRIPTION OF THE PREFERRED EMBODIMENTS

The first embodiment of the weighing device 10 shown in Figures 1 to 3 comprises an elongate flat strip 11 of sturdy yet flexible material usually plastics or metal having a central waisted portion 12 with enlarged end portions 13 and 14 each containing apertures 16 and 17. An upstanding flange 18 is attached to the underside of the central portion of the waisted portion. The flange has an upward projection 20 having a calibrated forward face 19.

15

To use the device to weigh suitcase S the elongate strip 11 is placed under the handle H of the suitcase S as shown in Figures 1 and 3a.

20 By gripping the strip 11 by pressing fingers through the apertures 16 and 17 the suitcase S can be lifted via the strip 11. As shown in Figures 2, 3b and 3c, the mass of the suitcase causes the ends 13, 14 to bend upwards against the calibrated scale 19 which then provides a ready indication of the weight of the suitcase S. It is envisaged that the calibrated scale 19 would include prominent marks that show the weight levels as determined by airlines for both economy and business class travel. Once the adjacent edge of the elongate strip has moved past one of these lines the user will be aware that the suitcase is above the prescribed limit.

30

Figure 3a shows the strip 11 carrying no load, Figure 3b shows a ready indication of a light load whilst Figure 3c illustrates the effect of a heavy load. The thickness and flexibility of the strip is selected to ensure the regular degree of movement against the calibrated scale.

35

The device 10 is about the size of an airline ticket and thus takes up very little room so that it can be simply carried in hand luggage.

5
Instead of the mechanical device described with reference to Figures 1 and 3, it is understood that the strip 11 could carry suitably positioned strain gauges which would provide an electrical signal that could be correlated to
10 the weight to which the strip is subjected. The strip 11 could also include a pressure sensitive chamber positioned directly under the handle to absorb the mass of the suitcase. The chamber could include a chemical substance that changes colour under load so that a change to a
15 selected colour would indicate that the weight of the piece of luggage has exceeded a particular threshold.

It is understood that the chemical make-up of pressure sensitive pads or chemical substances that change colour
20 under load would be known to those skilled in the art.

In the second and third embodiments shown in Figures 4 to 7, the weighing device 30 is handheld and is in the form of a substantially flat credit card shaped unit. The unit
25 incorporates a sensor panel 31 on its upper surface that senses downward pressure on the panel. The panel incorporates a load cell that is coupled to a liquid-crystal display (LCD) 32 and a suitable battery power source. The load cell senses the pressure on the sensor
30 panel and converts the pressure to an indication of weight.

In the embodiment shown in Figures 6 and 7, the device is placed on the palm of a hand as shown in Figure 6. The hand is then placed under the handle 4 of the suitcase S as
35 shown in Figure 7 and the suitcase is lifted so that the weight of the suitcase presses down on the sensor panel 31 on the upper surface of the device. This pressure is then

transmitted as a weight on the liquid crystal display 32. In the embodiment shown in Figures 4 and 5, instead of a liquid crystal display a series of lights 33, 34, 35, 36 representing recommended weights such as 20kg, 30kg, 40kg or 50kg are provided. The lights are preferably light emitting diodes. When the device is slid under the handle as shown in Figure 5, the appropriate light 34 is illuminated showing that the suitcase is at least as shown in Figure 5 30kg. Alternatively, the 20kg, 40kg or 50kg lights 33, 35 or 36 can illuminate. The device 30 thus provides a ready and simple means of showing that a predetermined weight has been exceeded. The device of both of these embodiments is very small, runs on a small watch battery and takes up very little space. It is understood that the pressure sensitive panel would be one of a number of proprietary items that provide an electrical signal that is proportional to pressure.

In the fourth and fifth embodiments shown in Figures 8 to 12, a weighing device 40 is incorporated into the handle 4 of the suitcases.

In the exploded view of Figure 9, the handle assembly 40 comprises an upper housing 41 with an aperture 42. The housing is of an arcuate shape and supports end portions 43, 44. The housing 41 is arranged to contain a circuit board assembly 45 that includes a pressure sensitive mechanism 46 and a liquid crystal readout 47. The assembly would also incorporate a battery to power the weighing device. The assembly terminates on the underside with an arcuate displaceable pressure plate 48 that has a central spigot 49 that rides on the pressure sensitive mechanism 46 of the circuit board 45. As shown in Figures 10a and 10b, the pressure plate 48 is pulled up into the assembly 40 against the pressure sensitive plate 46 as the handle H is gripped and the suitcase S lifted off the ground. In this way, the weight of the suitcase S is transferred through

the pressure sensitive plate to be recorded and indicated at the LCD readout 47. The final assembly of the handle is shown in Figure 8 from which it can be seen that the weighing device 40 is elegantly integrated into the design of a suitcase S so that travellers can buy a range of luggage each of which has its own built-in weighing device.

The assembly is moulded in plastics and is light and substantially the same size as a conventional handle. In order to prolong the life of the batteries that power the unit, it is understood that an on/off switch may be provided somewhere on the handle to prevent use of the assembly whenever the suitcase is carried.

In the embodiment shown in Figure 11, a very similar device 40 is incorporated except in this case instead of a single LCD readout 47, four space lights 50, 51, 52, 53 are provided across the top of the handle H, each light representing a threshold weight such as 10kg, 20kg, 30kg or 40kg.

The load cell between the pressure plate 48 and the top of the handle 41 would send electrical signal to each light in dependence on the weight of the suitcase.

In the embodiment shown in Figure 12, the load cell is replaced by a coloured indicator 60 which locates in an aperture 61 in the external cover 62 of the handle. The coloured indicator 60 is mounted on a support plate 63 and a pressure plate 64 has a single upstanding spigot 65 that acts against the underside of the coloured indicator 60 in the same manner as the spigot acts on the load cell in the embodiment of Figures 9 to 11. However, in this embodiment the coloured indicator is in the form of a disc that changes colour under pressure and thus changes colour proportional to the weight of the suitcase. As the pressure increases the colour of the disc can be calibrated

so that a change to a particular colour indicates that the luggage weighs more than a particular threshold.

Other embodiments not illustrated also incorporate the use
5 of pressure sensitive chemicals that change colour in dependence on pressure. A card or plastics sheet could be provided with bands of such chemicals. The card or sheet could be placed under the handle of the suitcase and the suitcase lifted via the card or sheet. In this way, the
10 weight of the suitcase would place pressure on the chemical laminate causing a change of colour and the colour would be calibrated to indicate whether airline thresholds have been exceeded.

15 The invention is also applicable to rucksacks or satchels especially those used by school children to carry their text books and laptops. The common practice of school children transporting excessively heavy loads in satchels and/or rucksacks is well known. The embodiments of Figures
20 13 to 17 provide a means that provides a ready indication that the load is too great.

The sixth embodiment is illustrated in Figures 13 to 15. Figure 13 shows a rucksack R that is supported by parallel
25 shoulder straps 70, 71 and a waist strap 72. As shown in Figure 15a and 15b, a resilient strip 75 of rubber or plastics is secured by stitching, welding or riveting in parallel along a length 76 of the strap 70 or 71 with the strap as shown in Figure 15a, when unloaded, being in an
30 unstressed slightly undulating configuration. When the strap 70 or 71 is placed under load the resilient member 75 stretches to absorb the slack in the strap as shown in Figure 15b. A cover 77, 78 is supported on each end of the resilient member 75 to assume a substantially closed
35 configuration when the strap 70, 71 is not under load as shown in Figure 14a, a partially expanded configuration when the strap 70, 71 is under partial load as shown in

Figure 14b, and a fully expanded configuration when the strap 70, 71 is under maximum load shown in Figure 14c. The resilient strap 75 would be coloured or otherwise marked as shown in the drawings so that as the load
5 increases there is a ready visual indication of that load which could be either caused by a flash of colour or a visible scale or warning sign that would warn a parent or teacher that the rucksack is carrying excessive weight. Thus, for instance, the resilient member 75 would be
10 calibrated so that the desired comfortable weight as shown in Figure 14a, a slightly excessive weight, whilst still permissible, is shown in Figure 14b and impermissible excessive weight is shown in Figure 14c. This feature could be on a single strap 70 or preferably on both straps
15 70, 71 as shown in the view of the rucksack R in Figure 13.

In another embodiment on the same theme shown in Figures 16 and 17, a concertina enclosure 80 having a series of parallel bellows 81 is attached to the strap 70 or 71 to
20 assume, in an unloaded configuration, the view in Figure 16a or 17a that is with the strap in an unstressed and undulating configuration. As a load is placed on the strap the elongate strap expands the bellows 81 to assume a different configuration shown in Figure 17b. When fully
25 under load the strap assumes the stretched configuration shown in Figure 17c which further expands the concertina bellows 81 to assume the profile shown in Figure 16b.

The bellows 81 can be painted in a manner that vivid
30 colours only become visible as the bellows expand so that in the fully expanded view shown in Figure 17a there may be a large red flash along the length of the bellows which would provide a ready indication that the strap 70, 71 is under excessive load.

35

It is understood that other more sophisticated means can be incorporated into devices of the kind described above such

as the use of strain gauges or load cells and indicator means that provide coloured lights or digital indication of the exact weight of a rucksack or satchel. However, a simple mechanical mechanism with a visual indicator is
5 viewed as the most practical and cost effect means of solving what is becoming an increasing problem that can result in serious spinal injuries to young children.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A weighing device for providing a ready indication of the weight of a piece of luggage, the device
5 comprising load bearing means adapted to be placed on or form part of the carry means of the piece of luggage and indicator means associated with the load bearing means whereby when the luggage is lifted by the carry means, the load bearing means is subjected to the mass of the piece of
10 luggage and the indicator means provides an indication of the weight of the piece of luggage.
2. The weighing device according to claim 1 wherein the load bearing means is an elongate strip of flexible
15 plastics or metal.
3. The weighing device according to claim 2 wherein the load bearing means has a load bearing centre portion between ends whereby when the piece of luggage is lifted by
20 gripping the ends the strip flexes due to load on the centre portion.
4. The weighing device according to claim 3 wherein each end has a hole which defines a finger grip enabling
25 the strip to be picked up.
5. The weighing device according to either claim 3 or 4 wherein the indicator means is a calibrated scale fixed to the centre portion adjacent one lateral edge of
30 the strip whereby that edge moves relative to the scale as the strip flexes under load.
6. The weighing device according to claim 1 wherein the load bearing means is a load cell positioned across a
35 housing adapted to be held in the palm of the hand whereby the device, in use, is positioned between the palm of the hand and the handle of the piece of luggage so that the

weight of the piece of luggage is sensed by the load cell as the hand lifts the luggage via the handle.

7. The weighing device according to claim 6 wherein
5 the housing supports the indicator means which provides a visual indication of the weight of the luggage.

8. The weighing device according to claim 7 wherein
10 the indicator means comprises a strip of coloured panels which light up proportional to the weight of the piece of luggage.

9. The weighing device according to claim 7 wherein
15 the indicator means is a coloured panel that changes colour in dependence of the weight of the piece of luggage.

10. The weighing device according to any one of
claims 7 to 9 wherein the housing is approximately the same dimensions as a credit card.

20

11. The weighing device according to any one of
claims 7 to 10 wherein the load cell is battery powered and the battery is located in the housing.

25 12. The weighing device according to any one of claims 7 to 11 wherein the indicator means is a liquid crystal display coupled to the load cell to provide a digital indication of the weight of the piece of luggage.

30 13. A handle assembly for a piece of luggage comprising a handle adapted to be connected to the piece of luggage, a pressure plate under the handle, a load cell between the pressure plate and the handle and indicator means coupled to the load cell to provide an indication of
35 weight subjected to the load cell when the piece of luggage is lifted by the handle.

14. The handle assembly according to claim 13 wherein the handle comprises an arcuate housing that is secured to either end of the piece of luggage, the housing supporting the load cell coupled to the indicator means that is
5 visible from above the handle, the pressure plate being supported by the housing under the load cell whereby when the handle assembly is picked up the weight of the piece of luggage is transferred to the load cell via the pressure plate and the indicator means provides visual indication of
10 the weight.

15. The handle assembly according to claim 14 wherein the indicator means is a liquid crystal display.

15 16. The handle assembly according to claim 14 wherein the indicator means is an array of lights which light up proportionally to the weight of the luggage.

17. The weighing device according to claim 1 wherein
20 the carry means is a shoulder strap of a rucksack or satchel and the load bearing means is either an elastic portion of the strap or an elastic strap attached parallel to an undulating portion of the strap.

25 18. The weighing device according to claim 17 wherein the indicator means constitutes part of the elastics strip or elastic portion of the strap that becomes exposed to provide a visual indication of the load bearing means being stretched under load.

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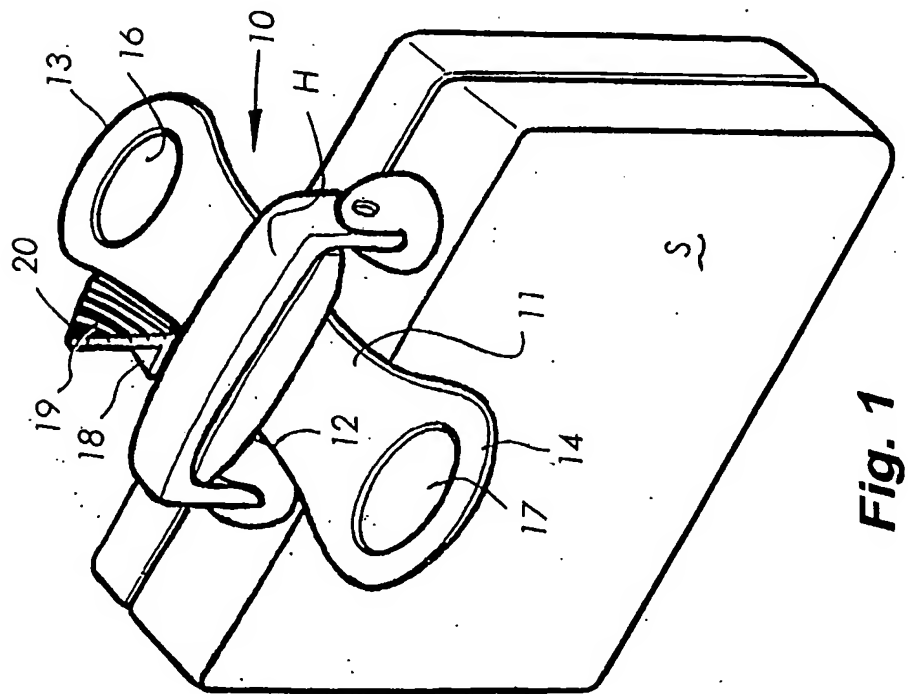
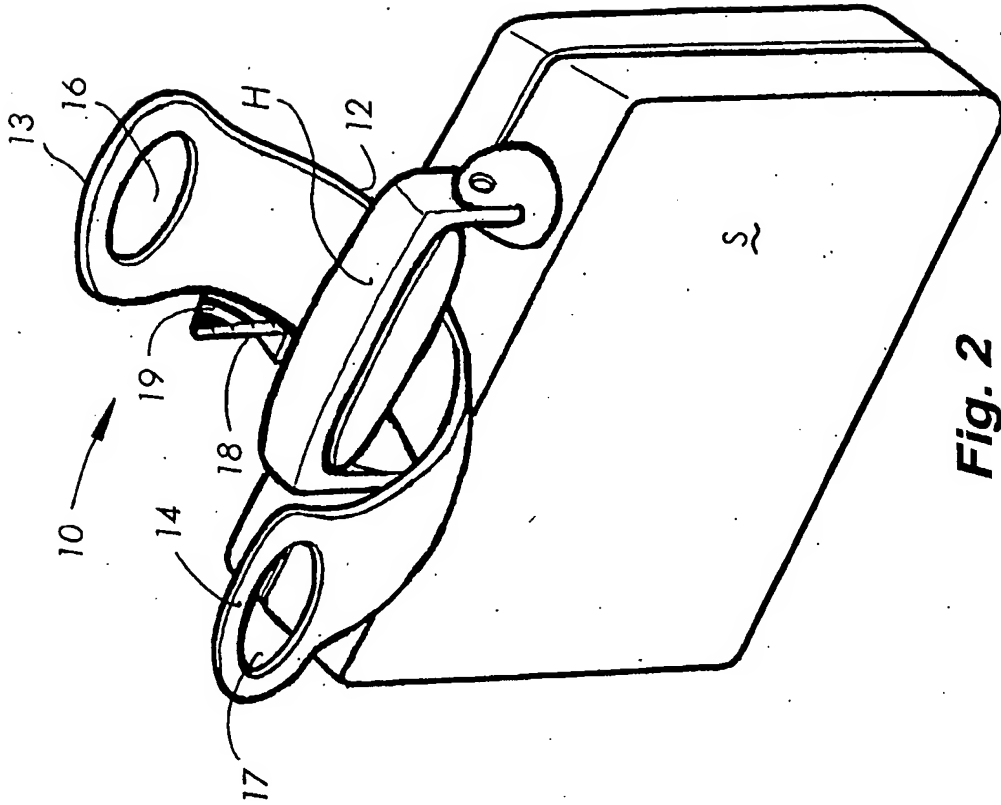
19. The weighing device according to either claim 17 or claim 18 wherein the elastic portion is covered from each end, the cover separating under load to expose the indicator means.

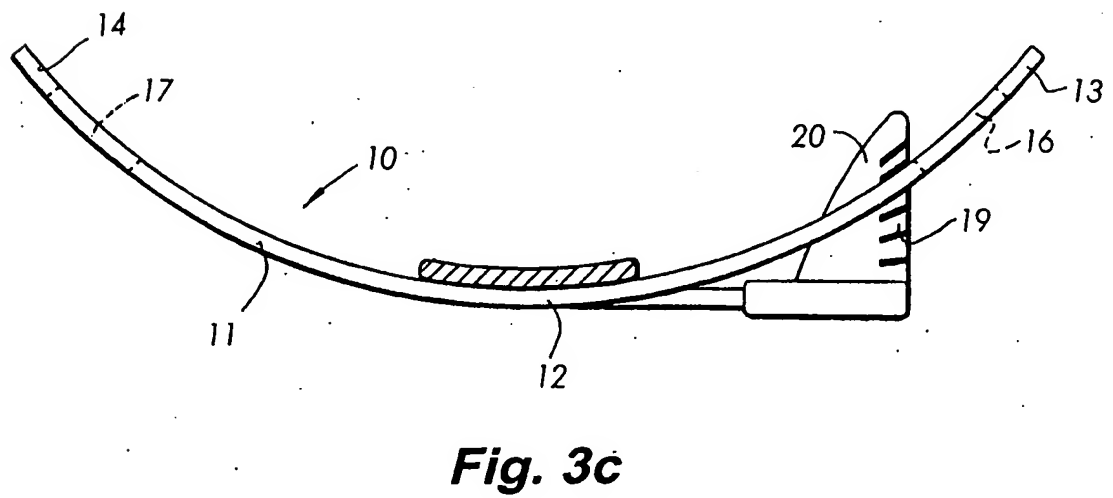
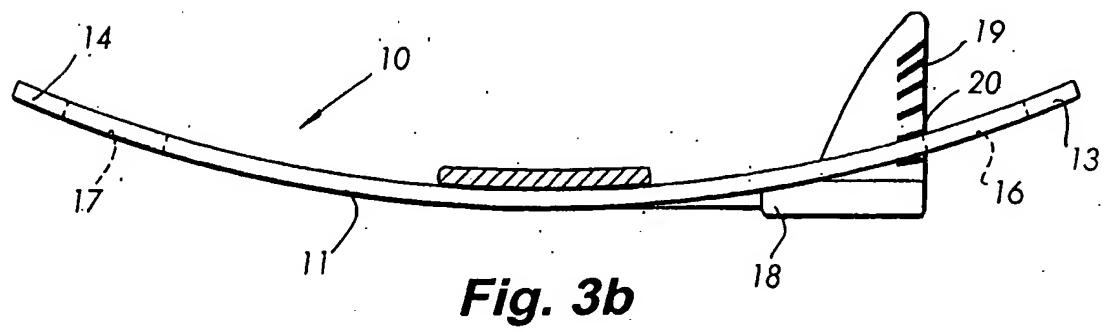
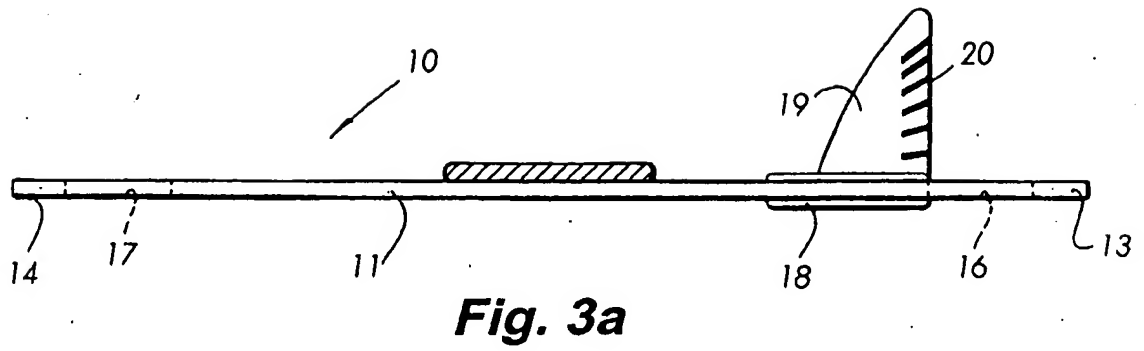
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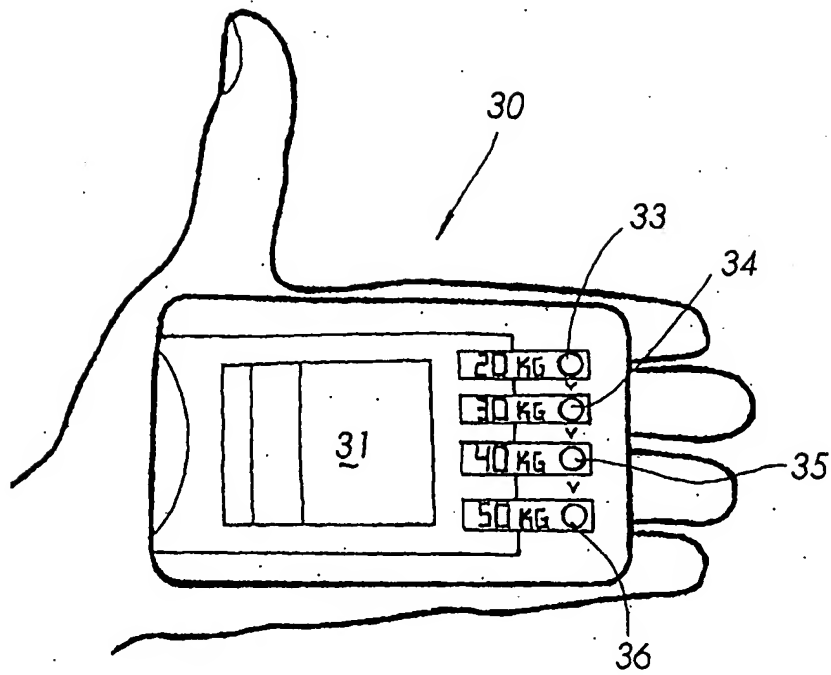
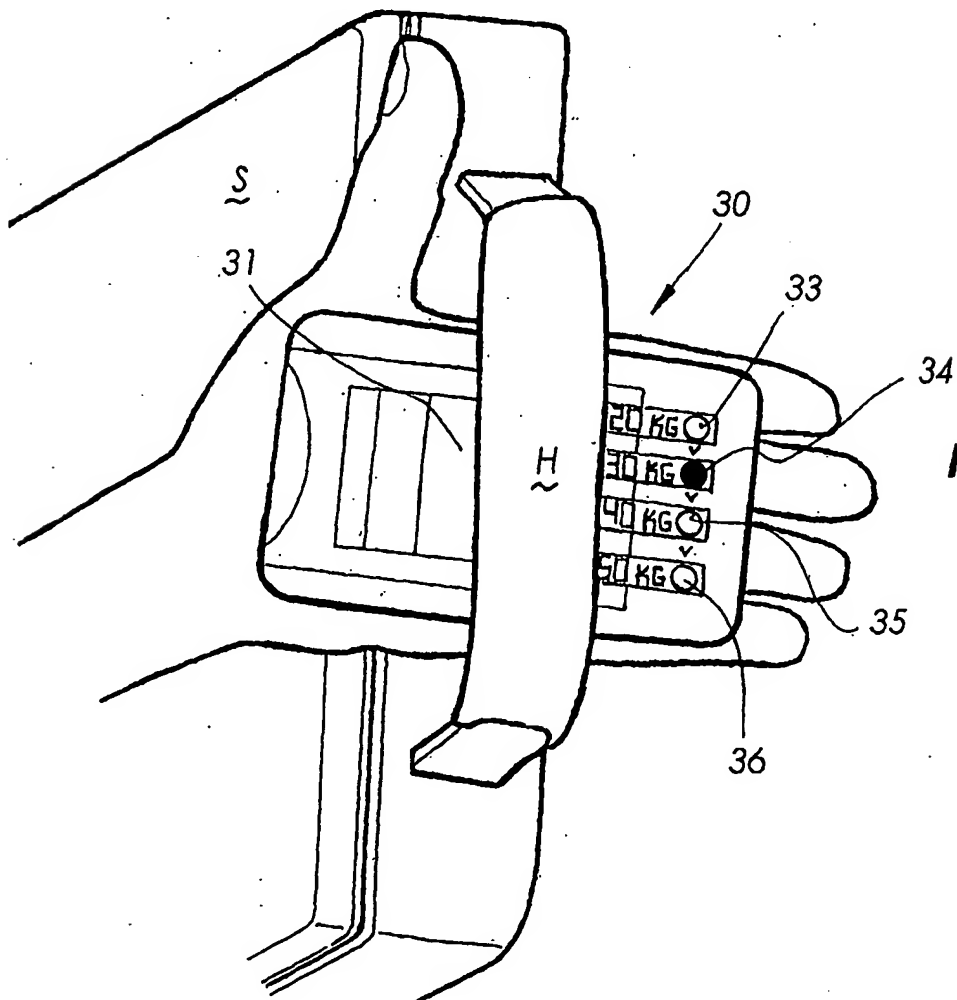
20. The weighing device according to claim 17 wherein the elastics strip comprises concertina bellows secured to

surround an undulating portion of the strap whereby the external configuration of the bellows change as the strip stretches under load.

- 5 21. The weighing device according to claim 20 wherein the bellows are coloured in a manner that the colours are exposed as the bellows change configuration on stretching.





**Fig. 4****Fig. 5**

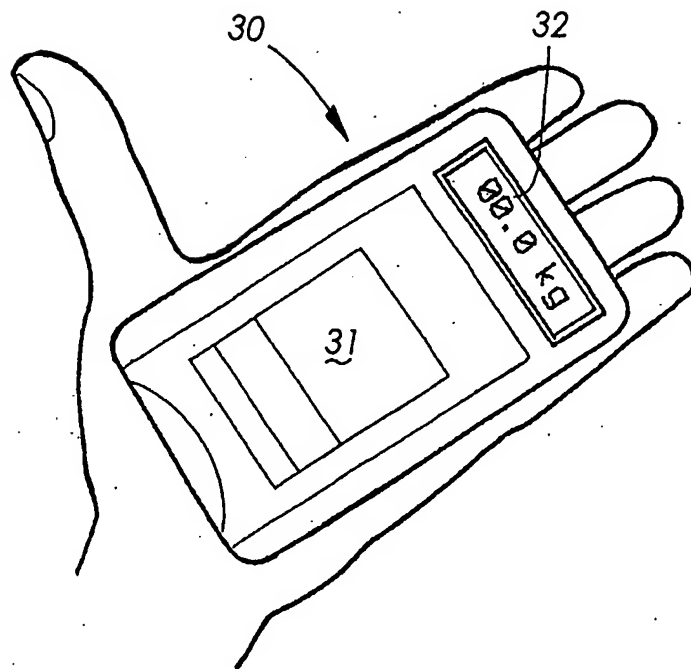


Fig. 6

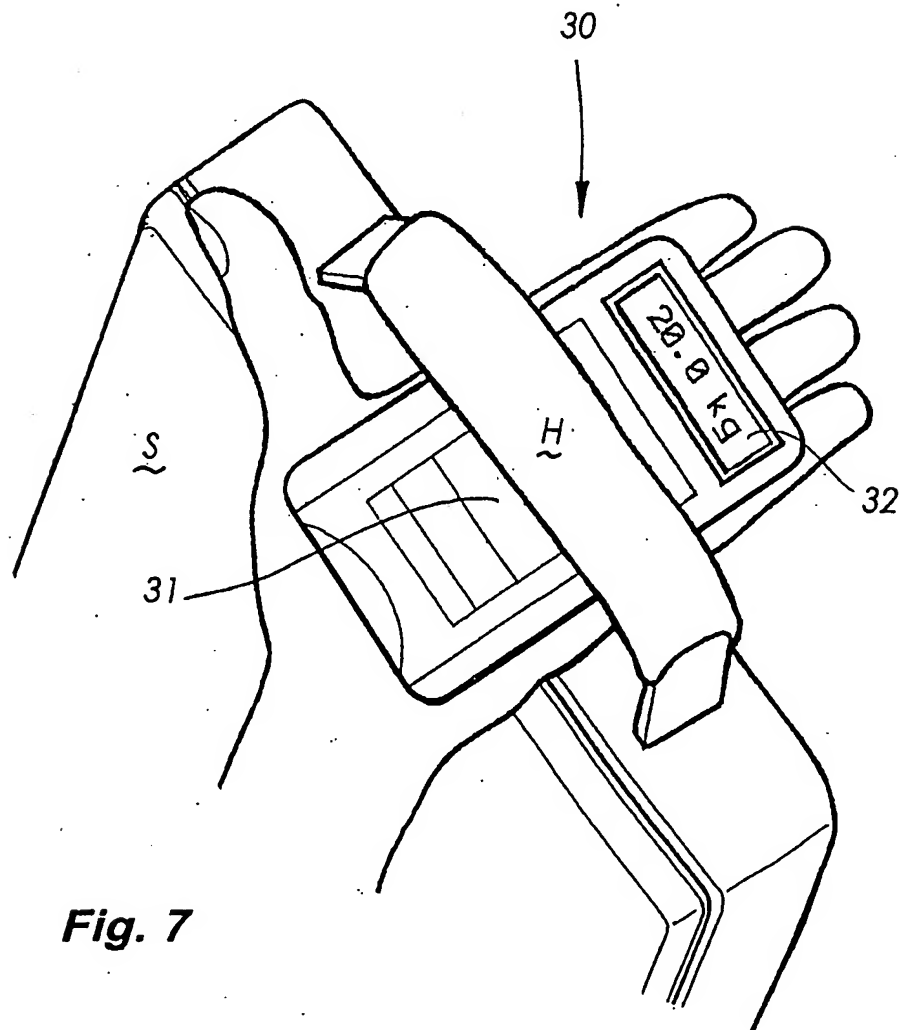
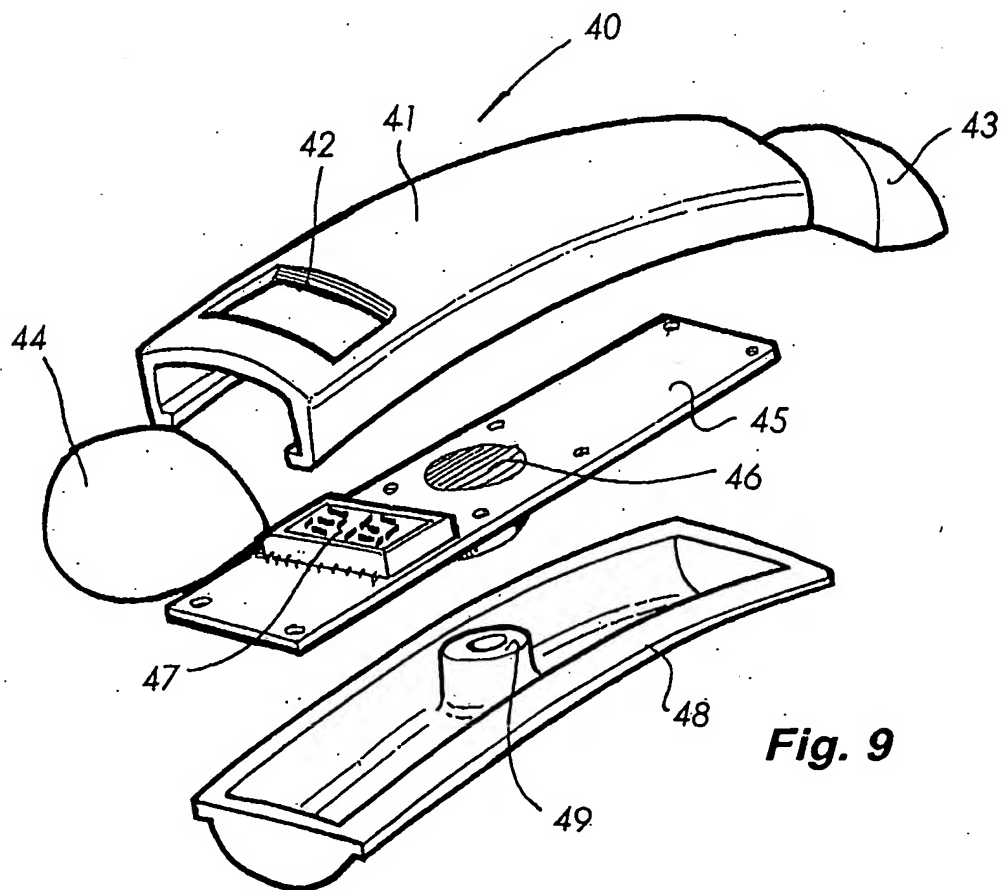
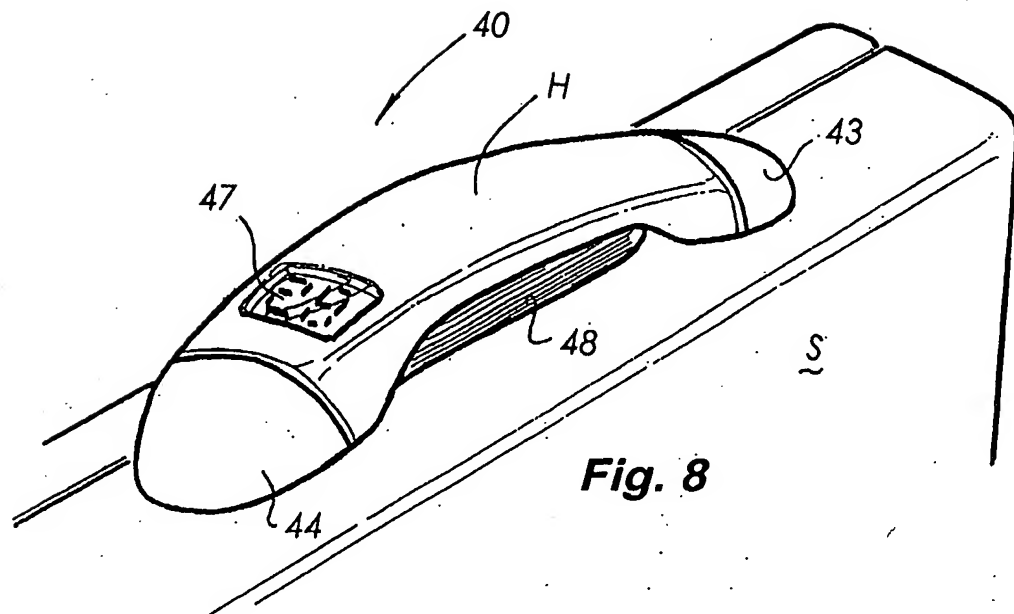


Fig. 7



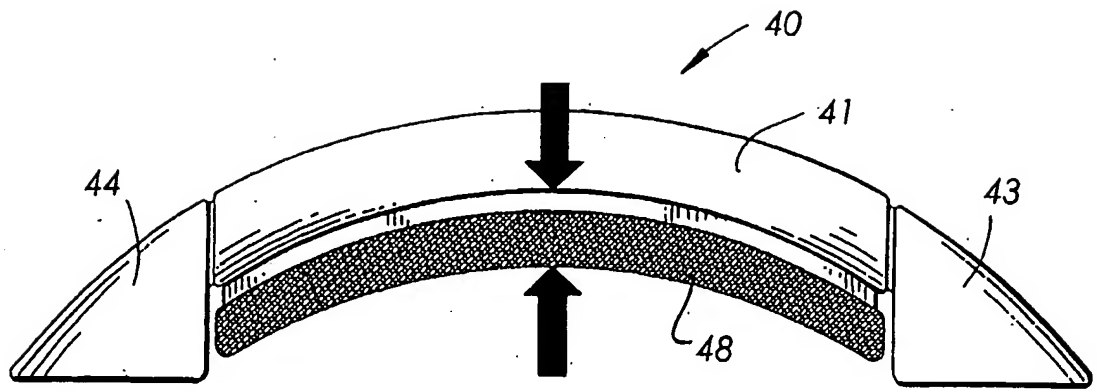


Fig. 10a

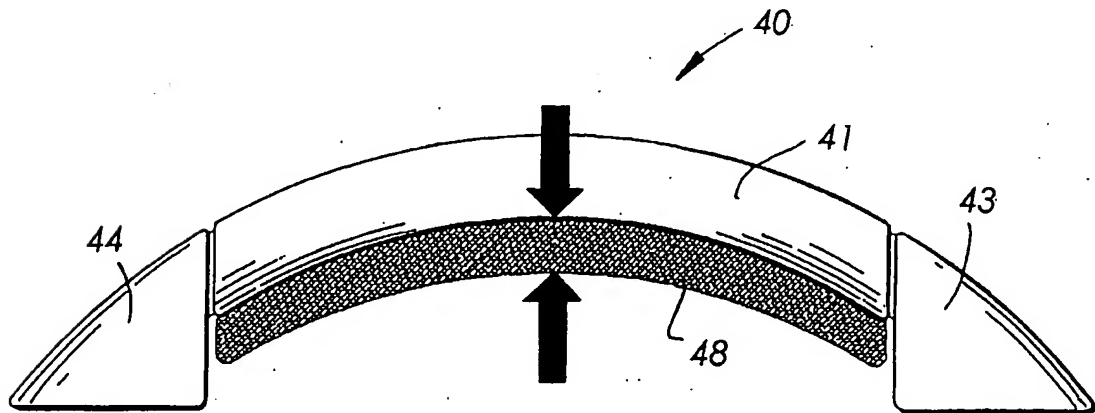
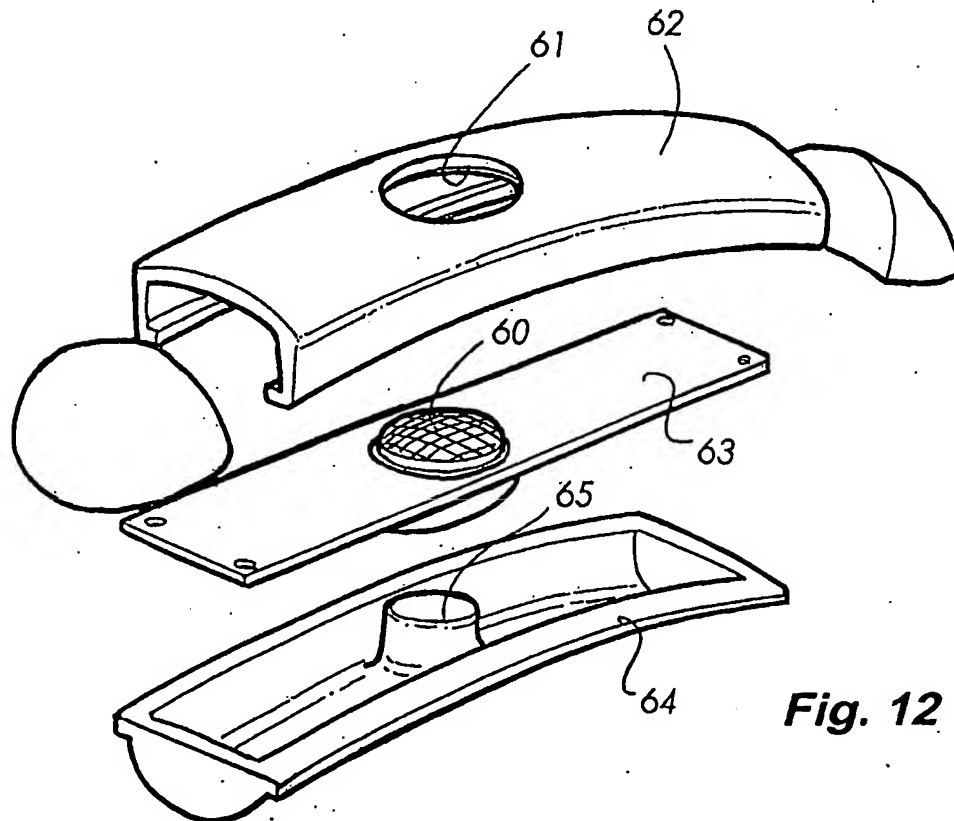
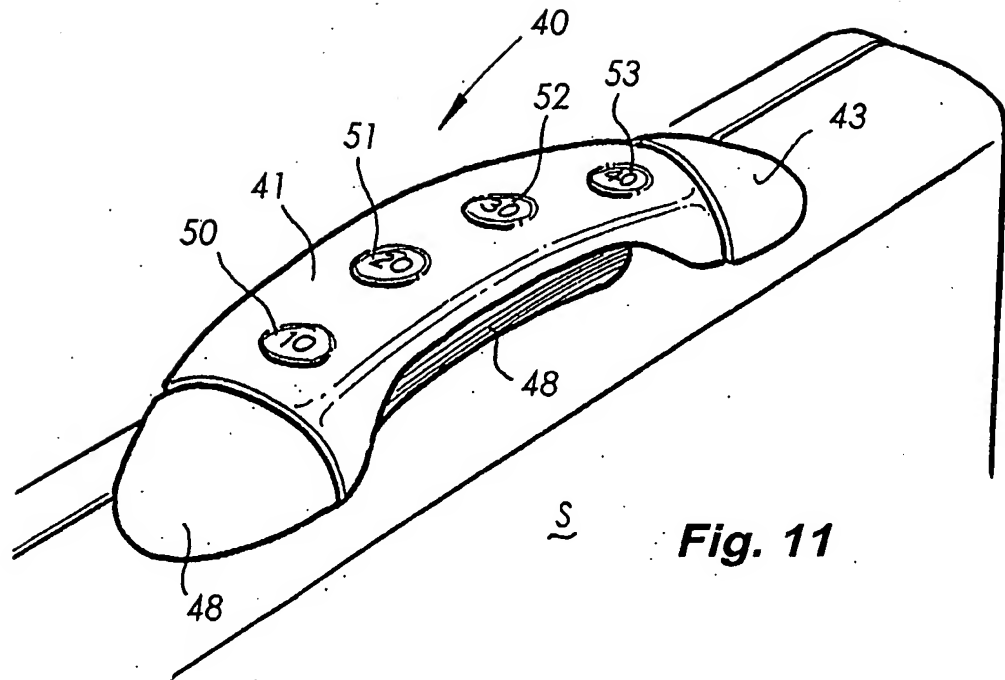
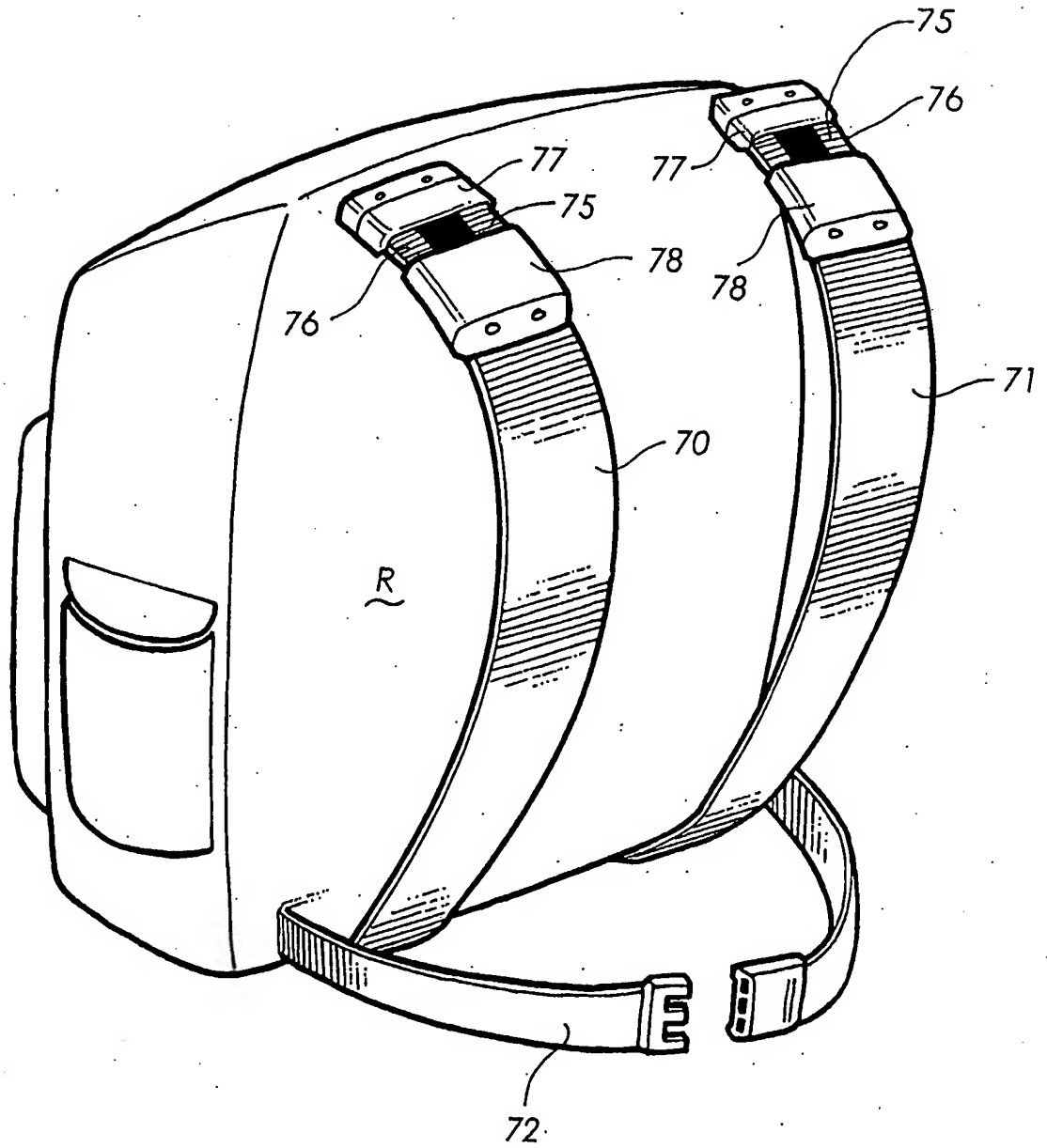


Fig. 10b



**Fig. 13**

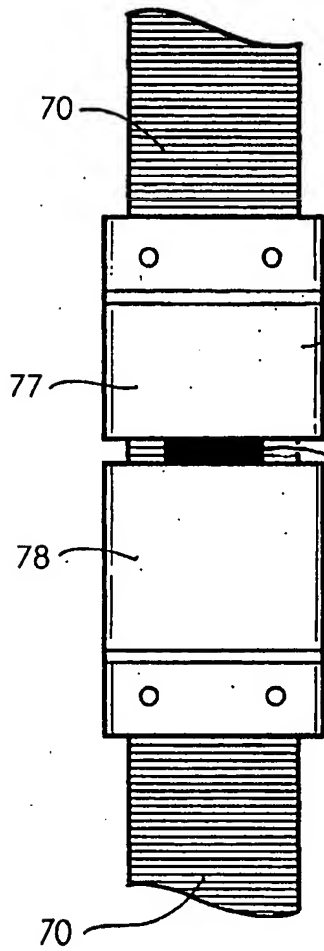


Fig. 14a

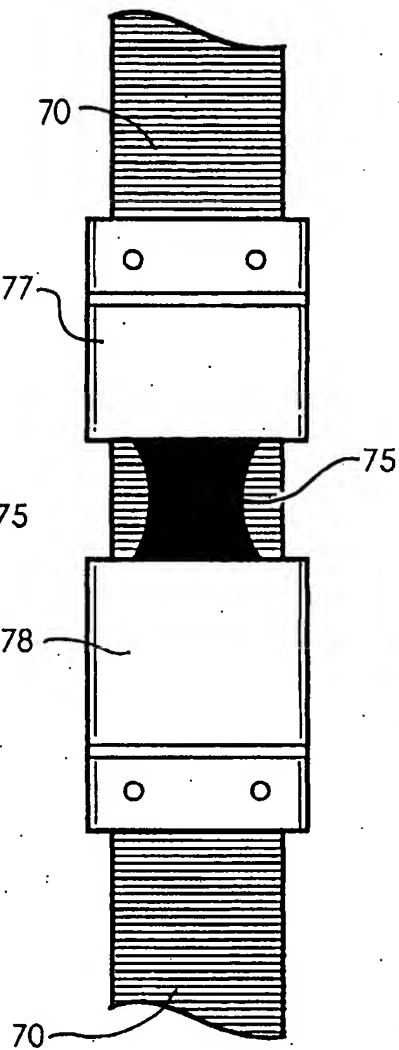


Fig. 14b

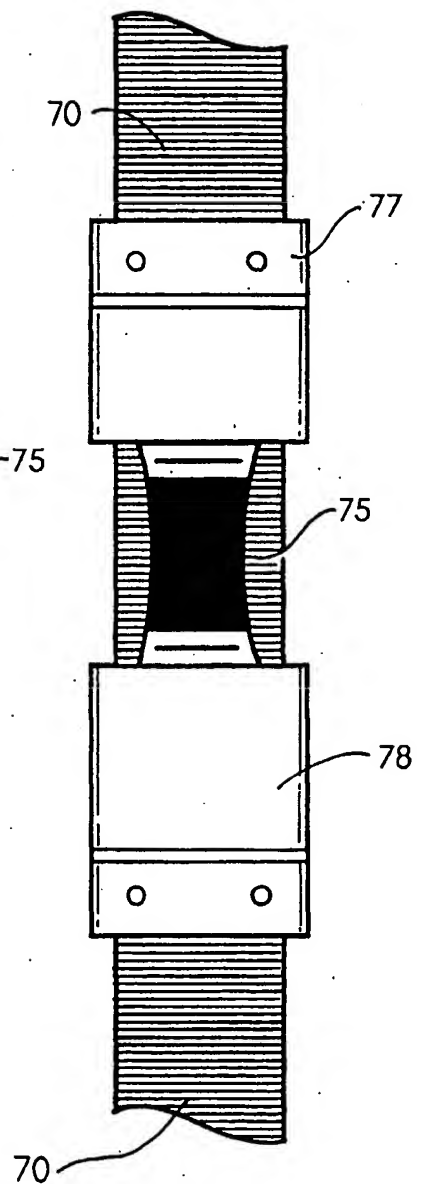


Fig. 14c

Fig. 15a

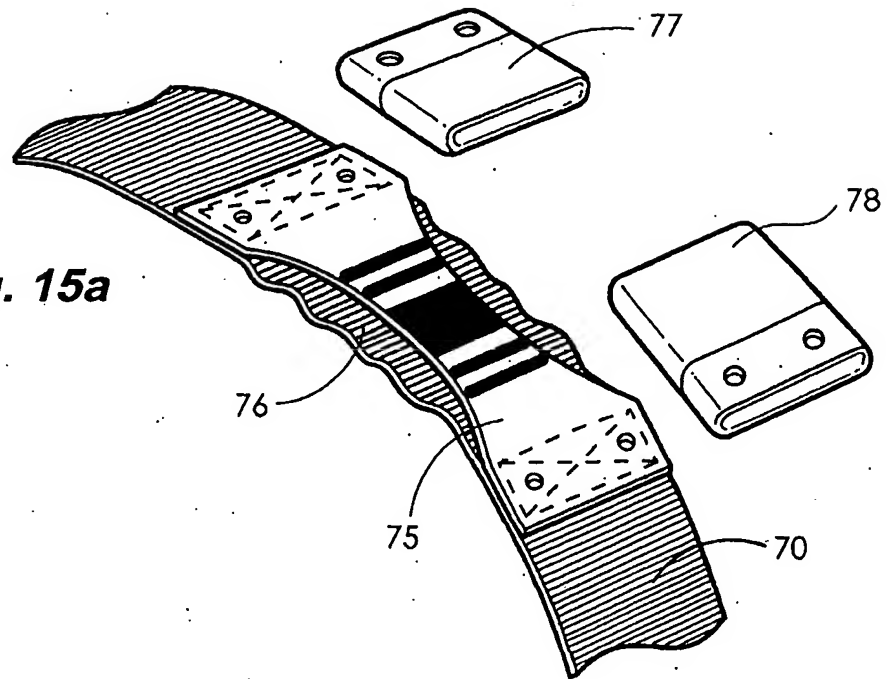
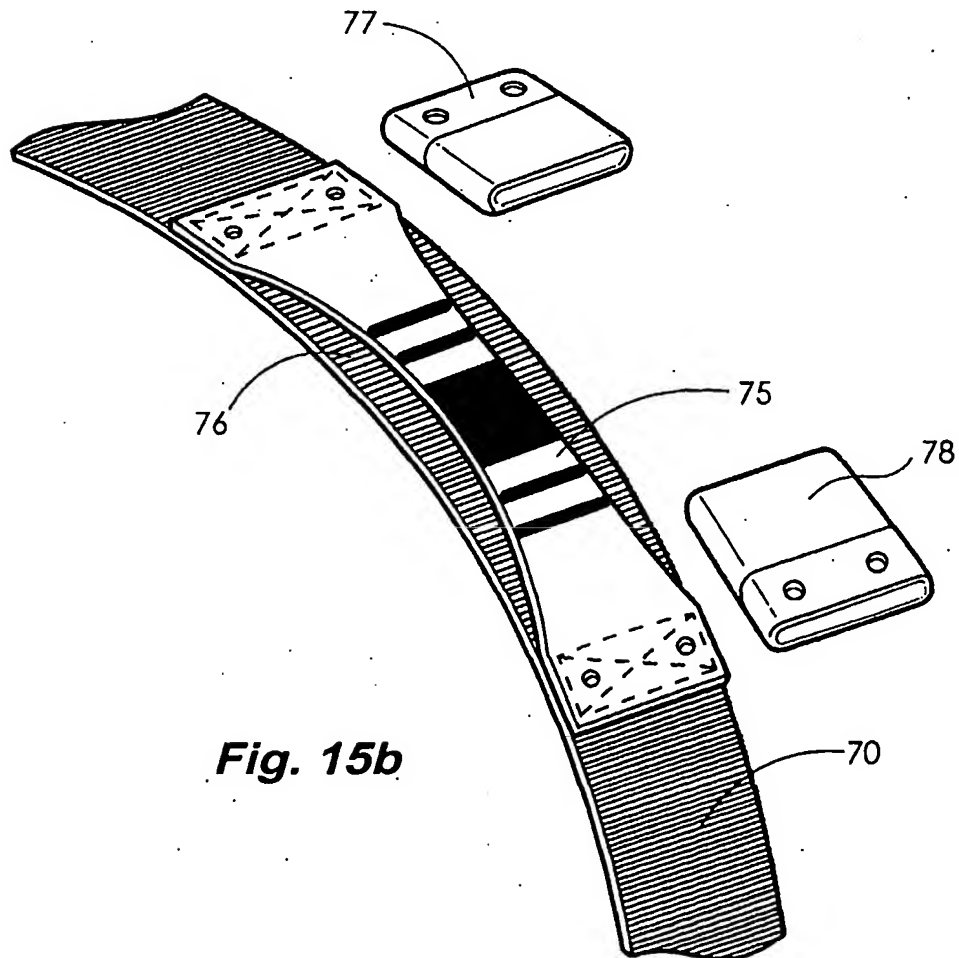
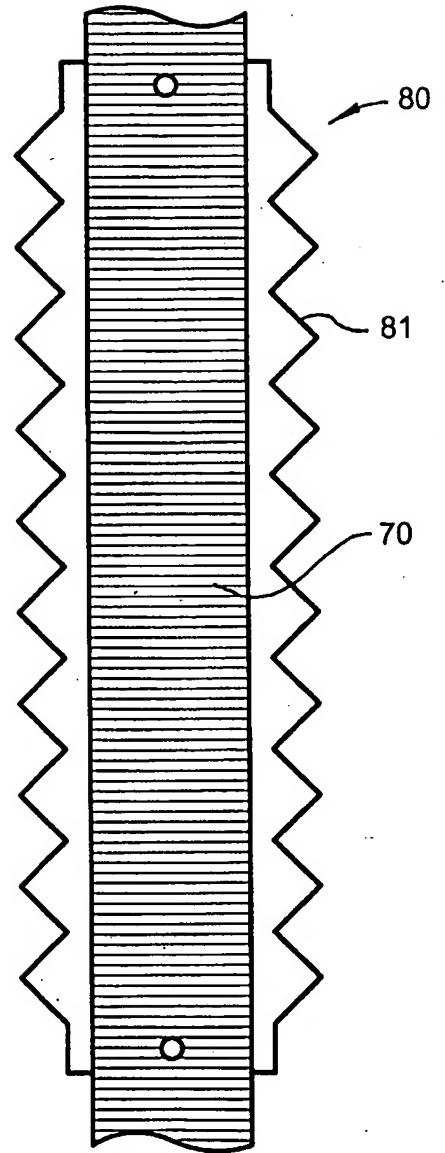
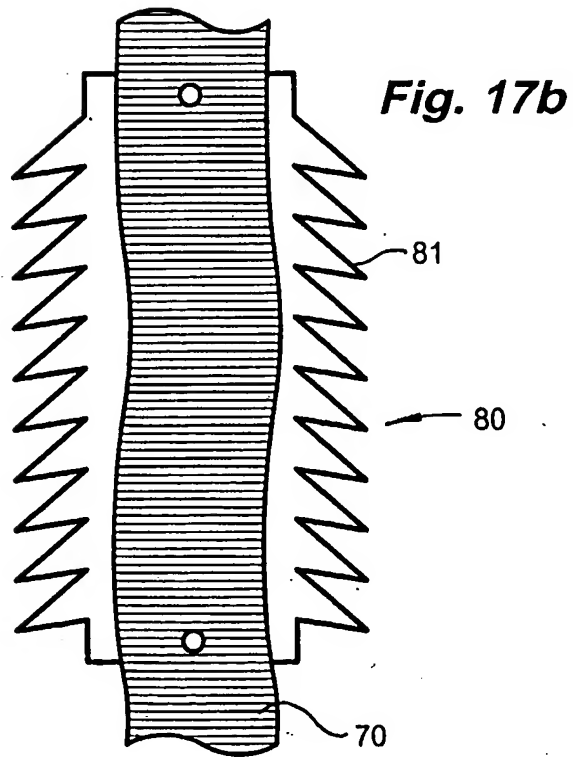
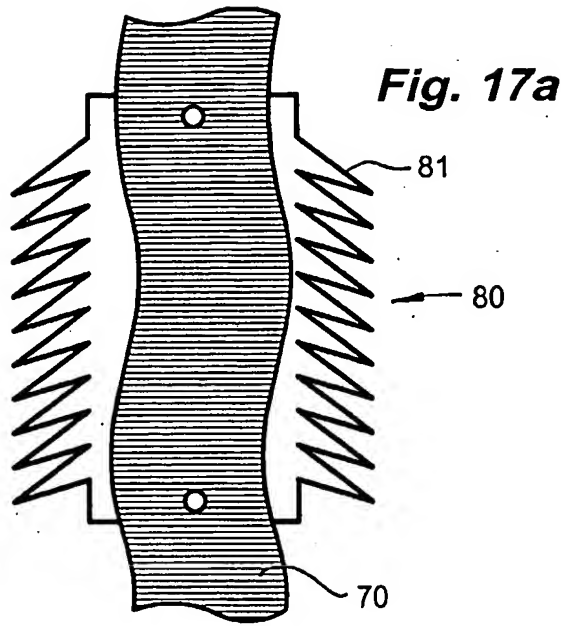


Fig. 15b





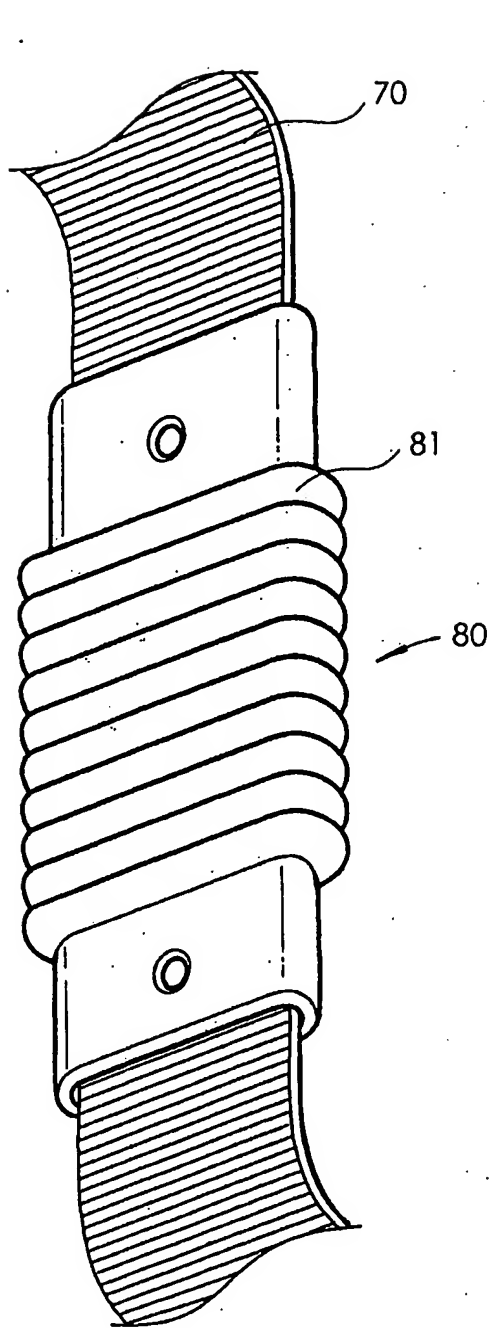


Fig. 16a

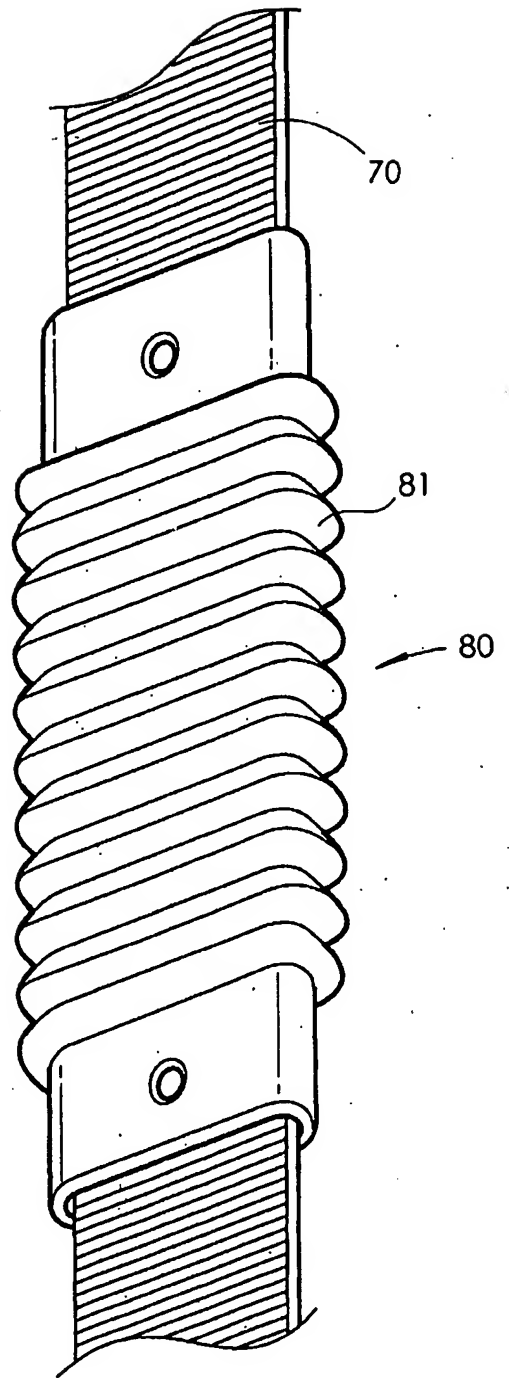


Fig. 16b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU03/00632

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. ⁷ : G01G 19/58, A45C 13/28		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI & JAPIO & keywords: weight, luggage, handle, carry, lift, load cell, flexible, elastic and other like terms		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	GB 1 308 915 A (KAY & KAY) 7 March 1973 page 1 line 36 - page 2 line 33 see entire document	1 13 - 16
X	Patent Abstracts of Japan, JP 11-169219 A (EGUCHI) 29 June 1999 paragraphs [0003] - [0014] of the automatic online translation	1, 13, 14
X	FR 2 639 432 A (MICHON) 25 May 1990 page 1 line 13 - page 2 line 25 and figure 1	1, 2
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search 18 June 2003		Date of mailing of the international search report 27 JUN 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer SUSAN PRING Telephone No : (02) 6283 2210

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00632

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 2,759,577 A (WHITE) 21 August 1956 column 1 line 57 - column 3 line 19 see entire document	1 13 - 16
X	Derwent Abstract Accession No. 97-054196/06, Class S02, DE 29 617 487 U (GOEBEL) 2 January 1997 see abstract	13 - 15
X, P	Derwent Abstract Accession No. 2002-714820/78, Class P24, S02, DE 20 210 055 U (MUNKERT) 2 October 2002 see abstract and figure 1	13 - 15
A	WO 98/59223 A (BRIGHTON et al.) 30 December 1998 see entire document	1, 13 - 16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU03/00632

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Patent Document Cited in Search Report		Patent Family Member	
GB	1308915	NONE	
JP	11169219	NONE	
FR	2639432	NONE	
DE	29617487	NONE	
DE	20210055	NONE	
WO	9859223	AU 84156/98	ZA 9804819
END OF ANNEX			